ing seventeen results show a mean difference of 485 lb. per square inch in the maximum shearing stress at breakdown, giving a discrepancy of 3 per cent. only. By calculation from the results of these tests, it is shown that the maximum tension hypothesis is wrong by 50 per cent., and the stretch hypothesis by 35 per cent., taking Poisson's ratio as 0·3. Mr. Turner's experiments may therefore be regarded as giving strong support to Guest's theory. The author proposes to investigate stress of three dimensions, and also to find how far the results obtained for static stress may be applied to the case of stress the magnitude of which is subject to constant variation.

THE twentieth annual issue—that for 1909—of the "Public Schools Year-book and Preparatory Schools Year-book" is now available. Among new features characterising the present volume may be mentioned articles on the universities, giving full details of universities other than Oxford and Cambridge; additional information on qualifying for the Scots Bar and the profession of Writer to the Signet; an article dealing with chemistry as a profession; and a list of lecturers who attend public and preparatory schools. To parents and others selecting either a school or a profession for their boys this enterprising annual should prove invaluable; it is published by Messrs. Swan Sonnenschein and Co., Ltd., and its price is 3*s*. 6*d*. net.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN MARCH:—

March 1. 11h. 32m. Neptune in conjunction with the Moon (Neptune 2° 37′ S.).
4. 12h. 37m. Variable star Algol at minimum.
5. 21h. 50m. Jupiter in conjunction with the Moon (Jupiter 3° 42′ S.)
7. 9h. 26m. Variable star Algol at minimum.
16. 3h. 3m. Mars in conjunction with the Moon (Mars 1° 26′ N.).
,, 14h. 19m. Uranus in conjunction with the Moon (Uranus 2° 4′ N.).
20. 13h. 0m. Venus in conjunction with the Moon (Venus 3° 52′ N.).
21. 23h. 46m. Saturn in conjunction with the Moon (Saturn 2° 41′ N.).
26. 8h. 54m. Mars and Uranus in conjunction (Mars 0° 18′ S.).
27. 11h. 8m. Algol at minimum.
28. 17h. 30m. Neptune in conjunction with the Moon (Neptune 2° 51′ S.).
30. 8h. 40m. Red spot central on disc of Jupiter.

A BRILLIANT METEOR AND ITS TRAIN.—A brilliant meteor was seen over a large part of the south of England about 7.30 on Monday evening, February 22. A luminous cloud or streak was visible for a long time after the meteor itself had disappeared. The Rev. F. J. Jervis-Smith, F.R.S., writing from Battramsley House, near Lymington (long. 1° 32′ W., lat. 50° 48′ N.), says:—"At 7.30 p.m. on February 22 my attention was directed by my gardener to a luminous streak or band left by a meteor, which he had seen about twenty minutes before while cycling near Brockenhurst. The streak was not straight, but slightly curved, first towards the north, then to the south, then again to the north, then, turning through about 110° to its mean path, towards the south, it was lost to sight. The streak passed through ϵ Ursæ Majoris and γ Cassiopeiæ. The streak was clearly visible up to 8 p.m. The width of the luminous band covered, roughly, one-eighth of the distance between δ and ζ Ursæ Majoris. The gardener described the luminous head of the meteor as being like the head and shoulders of a whale in shape. While I watched the streak a small meteor crossed the heavens, starting near Polaris, the path being south to north."

Miss Annie L. Waud, observing at Farnham, first observed the luminous appearance at 7.50 p.m. "It was then in Eridanus, and was a glowing streak of light, with two short branches or tails; the streak rapidly moved towards the north-west, the tails growing longer, the upper one gradually spreading through Orion, first through Rigel and then through the belt, finally stretching far beyond and above that constellation. The mass grew fainter as it sank at 8.30 p.m. towards the west, but the upper tail, which was now forked, was distinct until 9.30 p.m."

Dr. T. K. Rose saw this luminous train between Orion and the horizon, at Northwood, "from about 7.45 to between 9 and 10 o'clock, when it was lost in mist near the horizon. It was faint, and could not have been seen but for the brilliance of the night." The apparent shape of the luminous mass changed greatly during this interval, but no nucleus was seen by Dr. Rose at any time. With an opera-glass stars could be seen through the cloud.

QUANTITATIVE MEASURES OF THE WATER-VAPOUR IN THE MARTIAN ATMOSPHERE.—From measures of the relative intensities of the *a*, water-vapour, band in the spectra of Mars and the moon recently obtained by Mr. Slipher at the Lowell Observatory, Prof. Very has derived quantitative results showing the probable ratio between the amount of water-vapour in the Martian atmosphere and the amount of water-vapour in the Flagstaff atmosphere at the time the spectrograms were taken.

The measurements were made with a "spectral-band comparator" devised by Prof. Very, the narrower component of the *a* band, λ 7160–7200, being measured in every case; the relative intensity of the C band was also measured, on each set of spectra, as a check.

The readings given by the comparator were found to be very consistent, but were merely conventional. Reducing these measures so that they represent absolute intensities, Prof. Very finds that the *a* band in the spectrum of Mars is about 4·5 times as strong as in the lunar spectrum, and a further reduction brings out the fact that at the time of exposure the Martian atmosphere must have held in suspension about 1·75 times as much water-vapour as existed in the earth's atmosphere above Flagstaff.

Finally, Prof. Very arrives at the conclusion that whilst the atmosphere above Flagstaff contained sufficient precipitable water to give an average layer of about 8 mm. in depth, the average layer of precipitable water on Mars was about 14 mm.; the mean value for the earth would probably be three or four times as great (Lowell Observatory Bulletin, No. 36).

ABSORPTION OF LIGHT IN SPACE.—In a paper appearing in No. 1, vol. xxix., of the *Astrophysical Journal* (p. 46, January), Prof. Kapteyn discusses one or two phenomena which point to the absorption of star-light during its passage through interstellar space.

That the stars appear gradually to thin out as we recede farther and farther from the solar system is *a priori* evidence that some such absorption exists, otherwise we must assign to the sun a unique position in the universe, that is, the place of maximum density.

In a previous discussion Prof. Kapteyn found a provisional value for the absorption amounting to 0·016 of a magnitude for the distance of thirty-three light-years, as an average for the whole of the sky. Recently obtained results of spectral classification, from Harvard, permitted him to make another attack on the problem by investigating the probable average distances of Miss Maury's two classes of stars of which α Boötis and α Cassiopeiæ are typical. The spectra of the former of these two classes exhibit less general absorption than do those of the latter, and from an analysis of the proper motions given in Newcomb's "Fundamental Catalogue" Prof. Kapteyn finds that, *as a rule*, the proper motions in the α Boötis division greatly exceed those in the α Cassiopeiæ division. This is evidence that they are, as a class, nearer to us, and would, therefore, exhibit less general absorption, if it were due to an absorbing medium, than would the α Cassiopeiæ stars. Thus the present investigation strengthens the probability of the existence of such an absorbing medium.

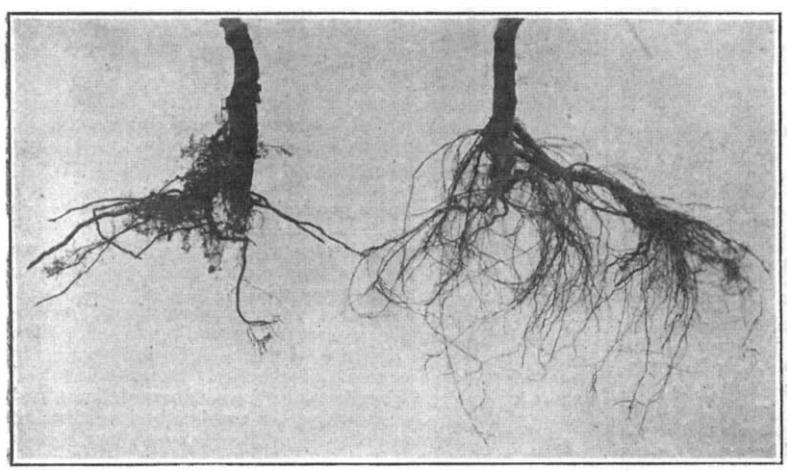
THE ORBIT OF θ AQUILÆ.—From radial-velocity observations made at the Allegheny Observatory during 1907, Mr.

Baker has derived new elements for the orbit of θ Aquilæ, which he gives and discusses in No. 7, vol. i., of the Publications of the Allegheny Observatory. These elements show the eccentricity of the orbit to be 0.685 ± 0.011, and the period of the binary to be 17.117 ± 0.0042 days. From observations made in 1901–2, M. Deslandres found a period of 16·7 days, and Mr. Baker ascribes the difference to an actual change of the period; the eccentricity is also probably variable.

THE PLANTING OF FRUIT TREES.[1]

MR. PICKERING is playing no new part when, in the recently issued report of the Woburn Fruit Farm, he appears as the demolisher of cherished convictions concerning so fundamental and practical a matter as tree planting. It is an article of faith among fruit-growers that fruit trees must be planted in a certain special way if success is to be obtained. The soil is properly prepared, a large hole is made, wide, but not deep, the roots are carefully spread out in all directions and arranged near the surface, with a slight upward bearing at the ends. The soil is filled in with many precautions. Small quantities of the finer soil are first worked in among the roots, hollow places caused by archings in the stouter roots are filled up, and then the rest of the soil is put in, trodden carefully down, and the whole left to the compacting influence of the rain. The tree is supported by stakes until it is sufficiently firmly established.

All this, according to the report before us, is precisely wrong; it is all exactly the opposite of what it should be. The proper way to plant a tree is to make a small hole, to double the roots up anyhow and stick the tree in, throw in the soil, and ram it down as hard as if one were fixing a gate-post. The experiments seem convincing enough.

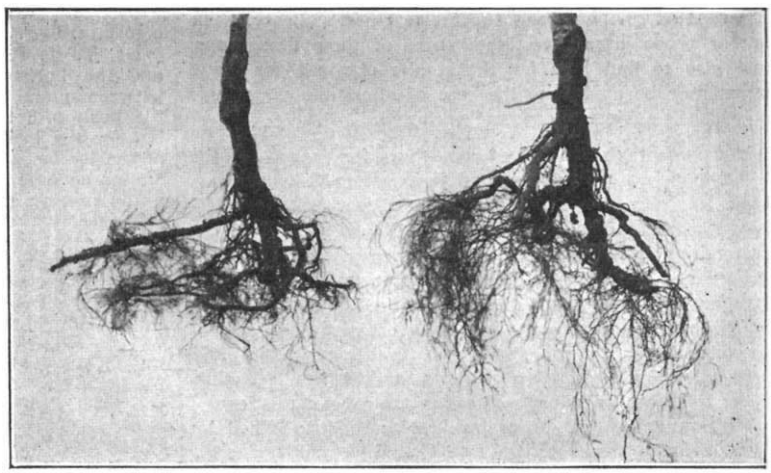


Not ammed. Rammed.

FIG. 1.—Gascoyne

They have been made at Woburn, Harpenden, Bedford, various places in Cambridgeshire, and in Devonshire; 59 per cent. of the sets showed in favour of ramming, 27 per cent. showed no difference (*i.e.* all the elaborate detail of the ordinary way of planting was simply a waste of time), and only 14 per cent. were against ramming. It makes no difference by what criterion the trees are judged; planting in this new way gives better results than planting in the orthodox fashion.

When a new fact is established by scientific experiment that no longer fits in with the old practical formula which has hitherto sufficed to cover all cases, there is invariably a cry raised about the antagonism of theory (or science)



Not rammed. Rammed.

FIG. 2.—Marie Louise.

and practice. This has duly happened in the present case. But no practical man has been able to give any reason for the faith that is in him beyond the fact that it is sanctioned by established custom; these appear to be the first serious experiments on the subject, and they do not seem to be vitiated by any constant error. Examination of the trees shows that ramming has led to a copious development of fibrous roots; the photographs here reproduced give an idea, though not an adequate one, of this effect. Direct experiments showed that the fibrous and small roots produced in the nursery before lifting play no great part as roots during the subsequent life of the tree; the important point is to induce fresh root formation, and ramming does this more rapidly than the orthodox method of planting. No harm was done, and sometimes even good resulted, when the old roots were deliberately damaged before planting.

It is to be hoped that these experiments may be continued on fruit soils of various types. Both the Harpenden and Ridgemont soils are heavier than the typical fruit soils of Kent; it would be interesting to see how ramming works on the brick earths, Thanet and Lower Greensand formations, where so much of our fruit is grown.

The reports issued from the Woburn Fruit Farm are always interesting, because they deal with fundamental problems of universal importance, and not merely with local matters. No fruit-grower could afford to make experiments himself on anything like the scale on which they are carried out at Woburn; and fruit-growers everywhere are under an obligation to the Duke of Bedford and Mr. Pickering for investigating their problems for them and publishing the results in so accessible a form.

E. J. RUSSELL.

[1] Ninth report of the Woburn Experimental Fruit Farm, by the Duke of Bedford, K.G., F.R.S., and Spencer U. Pickering, F.R.S.